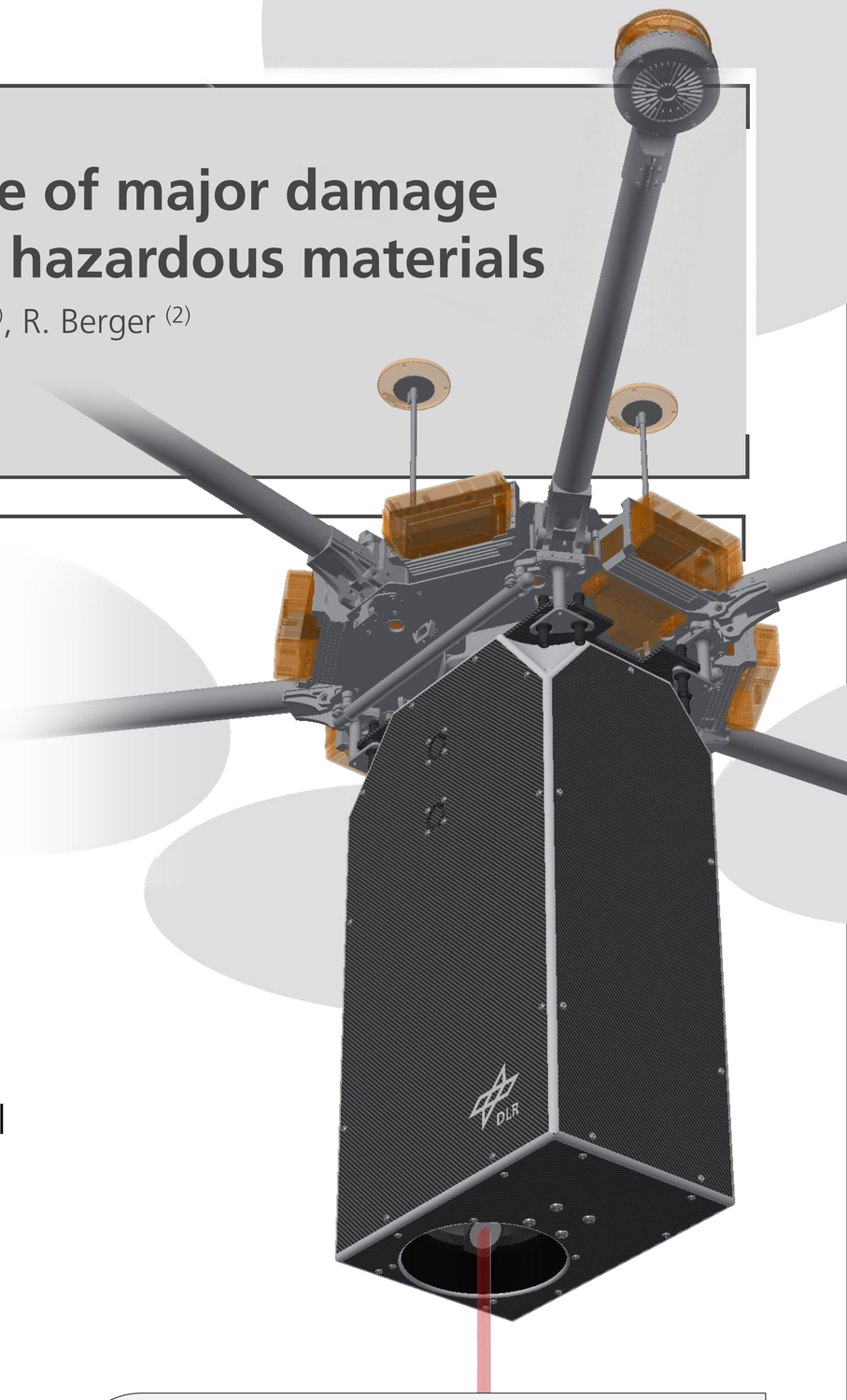
Institute of
Technical Physics &
Optical Sensor Systems

Laser based reconnaissance of major damage situations with leakage of hazardous materials

C. Kölbl [(1)], F. Gebert [(1)], F. Duschek [(1)], T. Kraft [(2)], R. Berger [(2)]

Deutsches Zentrum für Luft- und Raumfahrt e.V.
(1) Institut für Technische Physik
(2) Institut für Optische Sensorsysteme



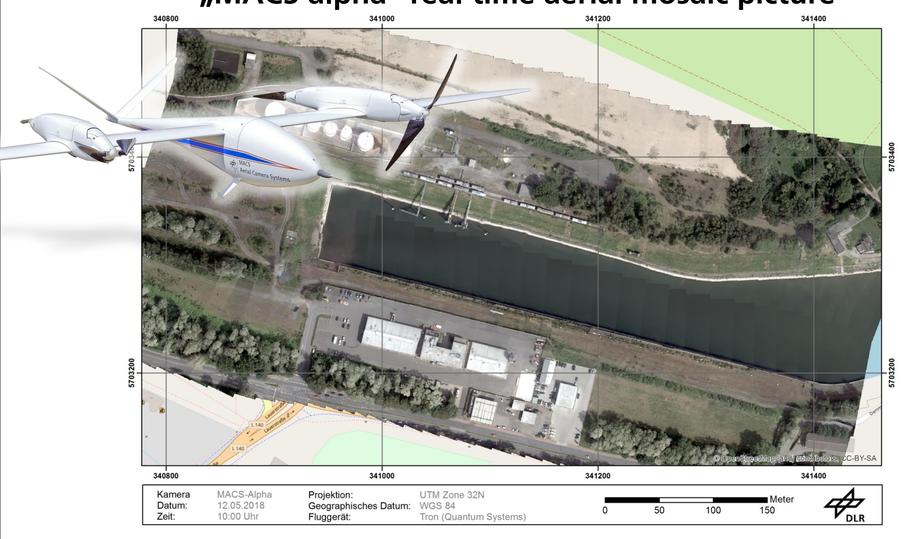
Motivation

- Fast reconnaissance of major damage and disastrous situations
- Prevention of human contact to hazardous materials from intended and accidental output from CBE hazardous material

Overall concept

- Fast reconnaissance of extensive areas with UAV system "MACS alpha" [(1)]
  - automatic flight to operation area
  - acquisition of geo-referenced aerial pictures in real time
  - assessment of the situation and determining the hazardous areas

„MACS alpha" real time aerial mosaic picture



- Characterization and identification of the leaked hazardous materials with the UAV system "LUCS" [(2)]
  - automatic flight to points of interest
  - laser based stand-off detection from a safe distance
  - identification of the released substance in real time
- Prompt for appropriate countermeasure based on the acquired information

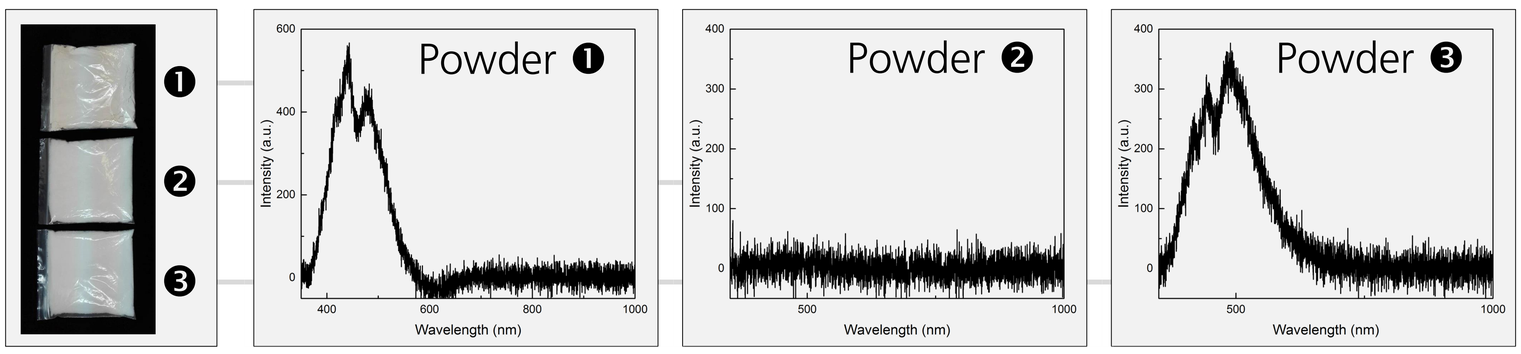
(1) MACS: Modular Aerial Camera System
(2) LUCS: Laser based UAV Classification System

LUCS – UAV based stand-off detection system

- Based on laser-induced fluorescence spectroscopy
  - detection from safe distances
  - suited for identification of chemical and biological warfare agents
- Framework / Requirements
  - eye safe system operation
  - high sensitivity for long range detection
  - automated classification of detected hazardous substances
  - low false alarm rate
- Advantages of LUCS
  - discreet detection system
  - prevention of human contact to hazardous CBE materials

LUCS detection system
UAV based detection and identification of CBE warfare agents

Technique:	laser spectroscopy
Working distance:	10 – 50 m
Detection rate:	1 kHz
Dimensions:	17 x 25 x 46 cm³
Weight:	6.5 kg



Experimental results

- Feasibility study of LUCS system
- Measurement and identification of white powders with LUCS under realistic conditions
  - detection distance: 10 m
  - measurement time: 100 ms
  - ambient light conditions
- Derivation of the scalability
- Measurements confirm the feasibility of a sensitive UAV based CBE stand-off detection system

Future tasks

- Further compaction of system
- Enhancement of sensitivity
- Extension by a laser based hyperspectral imaging system
- Implementation of gas detection

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